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Online gamification for science undergraduates

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Abstract

At the University of Wollongong teaching staff are well aware of the challenges involved in getting large numbers of new undergraduates inducted into the first year science laboratory classes.

Keywords

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ONLINE GAMIFICATION FOR SCIENCE UNDERGRADUATES

BY DR SIMON B BEDFORD, ROZA DIMESKA
AND MICHELLE WAKELAM

At the University of Wollongong teaching staff are well aware of the challenges involved in getting large numbers of new undergraduates inducted into the first year science laboratory classes. Health and safety practices are seen as 'very dry' by students and most induction programs do not persuade participants from this point of view. It is for this reason that traditional face-to-face inductions haven't always had the desired success in delivering health and safety learning outcomes and can be workload intensive for the teaching staff having to repeat inductions many times.

This study based on sound underpinning pedagogy and previous research in the area has demonstrated how to deliver health and safety learning outcomes that are a vital aspect of the scientific method, science discipline standards and ultimately successful science graduates.

The University of Wollongong team supported by grant funding has worked with Virtual Accident to create an engaging health and safety

induction program delivered via a hybrid-learning and hurdle assessment model to undergraduate students within the Faculty of Science, Medicine and Health. Hybrid learning takes the best of face-to-face and online teaching, with online hurdle assessments testing if learners have met the minimum standards required before they enter the laboratory. By running this over two semesters it is possible to see how well health and safety knowledge is retained long term.

Design of the Learning Module

Online gamification has been the key underlying pedagogy to promote self-efficacy within the learners to find out about health and safety for themselves rather than have it delivered to them by the staff. This has promoted engagement and motivation in the topic and better long term retention of the health and safety requirements. Due to design constraints this "game" is not a free style open ended game - it is more akin to a single pass platform game.

One of the main challenges was introduced by the rule set assessment hurdle - that if students did not achieve

Figure 1: Hurdle Assessment Test

OK Georgia has returned! Is she good to go now?

NOW is Georgia properly dressed to enter the Practical Class?
Let's recheck her & decide whether she is allowed in the lab or not.

| | Suitable? | |
|---|-------------------------------------|-------------------------------------|
| | Yes | No |
| Hair tied back? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Shoes? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Is she here by 9:30 am? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Should she be allowed to enter the lab? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Why not? (Click on an answer to choose it)

- A. She's too late, because it's more than 15 minutes after the start time
- B. She isn't wearing a hair net
- C. She is too late, because it is after the start time.

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Safety Score: 0 1 2 3 4 5 6 7 8 9 10

Figure 2: Progress Map



a one star rating for a challenge then they are ejected from the game and sent back to the start, encouraging students to take the challenge seriously. The hurdle assessments test (Figure 1) if learners have met the minimum standards required, but they are encouraged to re-take the challenge to get more stars - up to 3. The central design element is a launch screen or course map which was called the Progress Map (Figure 2) that learners return to after each challenge and shows progress through the module using visual elements (the stars) and feedback.

Design Considerations and Constraints

The online induction program needed to be able to be readily updated by teaching staff to ensure that the elements remain relevant and current so that it is a suitable replacement for any face-to-face induction even if there is a change in laboratory or location. For example if policy changed around personal protective equipment in relation to footwear then the shoe poster would need to be updated. However, the

authoring software also needed to be capable of some basic programming to achieve allocation of points and scoring to deliver the core gamification pedagogy. So there was a constraint around how scoring could be implemented as the other consideration around simple updating required us to stay within the limitations of the software.

Tracking of module scores in a gradebook was also an important consideration as it allows staff to know which students have met the minimum threshold requirements and so the module would need to be compatible with the learning platform - Moodle. In addition for the long term sustainability of the modules they need to be HTML5 compliant allowing students to access it on their mobile devices. It is for this reason that Adobe Captivate was chosen as a readily available flexible eLearning tool for this project.

Project Evaluation

Evaluation data has been collected for 12 months, analysed and the results of this along with feedback from staff, students,

and external peer review, has allowed the module to be developed using this action research cycle. At first, 350 students who were inducted by the traditional face to face method and subsequently undertook the new module were asked about the benefits. More than 20 teaching staff were surveyed on the improvements that they identified in their students in terms of better long term retention of the health and safety information within their laboratory classes. In each new cycle, which involved more student and staff, further improvements were made to the module and again the student and teaching staff feedback collected.

Overall, the teaching staff have seen better retention of health and safety learning outcomes in their students, and have had more time in face-to-face classes to spend on teaching science rather than health and safety inductions. The final module will be used in some six science subjects accounting for just under 1000 students in total.

Dr Simon B Bedford (@chssbb) teaches science at University of Wollongong and has research interests in assessment and feedback. He is passionately interested in utilising hybrid learning approaches to make teaching and assessment more effective and efficient. Contact via sbedford@uow.edu.au.

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